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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/880,574

06/13/2001

Hemanth T. Sampath

P127US

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09/03/2004

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EXAMINER

HA, DAC V

ART UNIT

PAPER NUMBER

2634

DATE MAILED: 09/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/880,574

Applicant(s)

SAMPATH ET AL.

Examiner

Dac V. Ha

Art Unit

2634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 June 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-54 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-54 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. **Claims 1-3, 6-8, 12-14, 17-19, 23-25, 28-30, 33-35 ,38-40, 44-46, 49-51** are rejected under 35 U.S.C. 102(e) as being anticipated by Ramesh (US 6,151,484).

Regarding claim 1, Ramesh discloses the claimed subject matter “receiving a signal comprising a plurality of training symbols embedded within a plurality of data symbols; estimating a plurality of training channel responses for the plurality of training symbols; and adapting an interpolator for generating a plurality of data channel responses for the plurality of data symbols by interpolating the plurality of training channel responses” in which the channel estimating (Figure 5, element 560) estimates the channel on the basis of the pilot symbols the result is adaptively interpolated in the channel interpolating (Figure 5, element 540; col. 7, lines 21-35).

Regarding claim 2, Ramesh discloses the claimed subject matter “wherein the interpolator is adaptively modified based on at least one system characteristic” in Figure 5, element 547; col. 7, lines 29-35.

Regarding claim 3, Ramesh discloses the claimed subject matter “generating a characteristic signal based on at least one of an estimated delay spread, an estimated Doppler spread, an estimated noise, an estimated interference, a modulation order, a training tone location, a training tone density, a number of transmit antennas, a spatial configuration of transmit antennas, and a transmit diversity mode, wherein the interpolator is adaptively modified based on the characteristic signal” in col. 6, tables I and II.

Regarding claim 6, see claim 1 above and also Figure 2.

Regarding claims 7-8, see claims 2-3 above, respectively.

Regarding claim 12, Ramesh discloses the claimed subject matter “receiving a signal comprising a plurality of training symbols embedded within a plurality of data symbols; estimating a plurality of training channel responses for the plurality of training symbols; and selecting at least one of a plurality of interpolators for generating a plurality of data channel responses for the plurality of data symbols by interpolating the plurality of training channel responses” in which the channel estimating (Figure 5, element 560) estimates the channel on the basis of the pilot symbols the result is selectively interpolated in the channel interpolating (Figure 5, element 540; col. 7, lines 21-35).

Regarding claims 13-14, see claims 2-3 above, respectively.

Regarding claim 17, see claim 12 above and also Figure 2.

Regarding claims 18-19, see claims 2-3 above, respectively.

Regarding claims 23-25, see claims 1-3 above, respectively.

Art Unit: 2634

Regarding claims 28-30 see claims 12-14 above, respectively.

Regarding claims 33-35, see claims 6-8 above, respectively.

Regarding claims 38-40, see claims 17-19 above, respectively.

Regarding claims 44-46, see claims 12-14 above, respectively.

Regarding claims 49-51, see claims 17-19 above, respectively.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 4, 5, 9-11, 15, 16, 20-22, 26, 27, 31, 32, 36, 37, 41-45, 47, 48, 52-54** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ramesh in view of Chan et al. (US 5,127,051) (hereinafter Chan).

Regarding claim 4, Ramesh disclose all the claimed subject matter in claim 4, as stated above, except for the claimed subject matter “wherein each of the plurality of training symbols are embedded within the plurality of data symbols over at least one of time, frequency, and code, further comprising the step of:

generating a data channel response for each of the plurality of data symbols by interpolating the plurality of training channel responses across at least one of time, frequency, and code”. Chan, in the same field of endeavor, discloses the claimed subject matter “wherein each of the plurality of training symbols are embedded within

Art Unit: 2634

the plurality of data symbols over at least one of time, frequency, and code, further comprising the step of:

generating a data channel response for each of the plurality of data symbols by interpolating the plurality of training channel responses across at least one of time, frequency, and code” in the Abstract; Figure 1.

While Ramesh does not elaborate on the particular structure of the received signal symbols in the pilot assisted channel estimation, a person of ordinary skill in the art would have realized that the pilot symbols should be embedded into the frame periodically (as shown in Chan). A person of ordinary skill in the art would have also realized that the interpolation should be done over the desired criteria, such as frame (i.e. see Chan). Therefore, claim 4 would have been rendered obvious over Ramesh in view of Chan.

Regarding claim 5, the disclosure of Ramesh can be applied to any communication system including analog and digital (col 1, lines 14-24). Therefore, the claimed subject matter “generating the signal using at least one of an orthogonal frequency division multiplex protocol, a code division multiplex protocol, a wavelet transform protocol, a frequency hopping protocol and single carrier protocol” would have been an intended use and would have been obvious to one skilled in the art.

Regarding claims 9-10, see claims 4-5 above, respectively.

Regarding claim 11, Chan further discloses “separating each plurality of training symbols by at least one of time, frequency, and code” in Figure 1.

Regarding claims 15-16, see claims 4-5 above, respectively.

Regarding claims 20-22, see claims 9-11 above, respectively.

Regarding claims 26-27, see claims 4-5 above, respectively.

Regarding claims 31-32, see claims 15-16 above, respectively.

Regarding claims 36-37, see claims 9-10 above, respectively.

Regarding claims 41-43, see claims 20-22 above, respectively.

Regarding claims 47-48, see claims 15-16 above, respectively.

Regarding claims 52-54, see claims 20-22 above, respectively.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kim et al. (US 6,751,274) disclose Apparatus And Method For Channel Estimation In Radio Communication System.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dac V. Ha whose telephone number is 571-273-3040. The examiner can normally be reached on 5/4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on 571-272-3056. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

Art Unit: 2634

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "Dac V. Ha", with a horizontal line underneath.

Dac V. Ha
Examiner
Art Unit 2634